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Policy Report

SEISMIC SAFETY ELEMENT FOR THE GENERAL PLAN

County of Mono

Prepared by:

Envicom Corporation

~~July 26, 1976~~

Amended 3/82

RESOLUTION NO. 82 - 13

A RESOLUTION OF THE MONO COUNTY PLANNING COMMISSION ADOPTING FOR TRANSMITTAL TO THE BOARD OF SUPERVISORS AMENDMENTS TO THE OPEN SPACE AND CONSERVATION ELEMENTS AND SEISMIC SAFETY ELEMENT OF THE GENERAL PLAN.

WHEREAS, the State of California mandates that all counites and cities shall prepare and adopt Open Space and Conservation Elements and a Seismic Safety Element: and

WHEREAS, Mono County in compliance with the General Plan extension granted by the State Office of Planning and Research has caused to be prepared amendments to the Open Space and Conservation Elements and Seismic Safety Element, and a negative declaration; and

WHEREAS, the Planning Commission of the County of Mono did on the 11th day of March 1982, hold noticed and advertised public hearings to hear all testimony relevant to said plan;

NOW, THEREFORE, BE IT RESOLVED that the Planning Commission of the County of Mono does hereby approve and adopt the amendments to the Open Space and Conservation Elements and Seismic Safety Element and a negative declaration.

NOW, THEREFORE, BE IT FURTHER RESOLVED that the Planning Commission of the County of Mono finds and determines that preparation and subsequent adoption thereof will not have a significant impact on the environment.

PASSED AND ADOPTED this 11th day of March 1982 for transmittal to the Board of Supervisors with a recommendation for adoption and findings that the preparation and subsequent adoption will not have a significant impact on the environment.

AYES: Commissioners Rehnke, Good, Lemon, Stout

NOES: None

ABSTAIN: None

ABSENT: Commissioner Fraser

Madalene K. Good

Madalene K. Good, Chairperson
Mono County Planning Commission

ATTEST: Keith R. Hartstrom

Keith R. Hartstrom
Assistant Planning Director

Approved as to form:

Bret H. Reed, Jr.
Deputy County Counsel

82-13

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

A. LEGISLATIVE AUTHORITY

The California State Legislature, through requirements of the Seismic Safety Element, has placed specific responsibilities on local government for identification and evaluation of seismic hazards and formation of programs and regulations to reduce risk. Specific authority is derived from Government Code Section 65302(f) which requires a Seismic Safety Element of all city and county general plans, as follows:

> "A Seismic Safety Element consisting of an identification and appraisal of seismic hazards such as susceptibility to surface ruptures from faulting, to ground shaking, to ground failures, or to the effects of seismically induced waves such as tsunamis and seiches.
>
> "The Seismic Safety Element shall also include an appraisal of mudslides, landslides, and slope stability as necessary geologic hazards that must be considered simultaneously with other hazards such as possible surface ruptures from faulting, ground shaking, ground failure, and seismically induced waves." [Section 65302(f)].

The effect of the section is to require cities and counties to take seismic hazards into account in their planning programs. The principal catalyst for these requirements was the February 9, 1971, San Fernando earthquake in which 65 people were killed and property damage exceeded the billion dollar mark. Conclusions from the 1973 Urban Geology Master Plan for California also give cause for considering geologic hazards in the planning process. Summary conclusions from this study estimate dollar losses due to geologic hazards in California between 1970 and 2000 will amount to more than $55 billion.

B. PURPOSE AND APPROACH

- To fulfill the requirements of State planning law which states that a Seismic Safety Element is a mandated part of the General Plan required by each county in the State of California.

- To assist in allocation of public resources in Mono County, to develop information regarding seismic hazards and thereby develop a systematic approach to protect public health, safety and welfare from such hazards. Such information and protection devices are designed to further judicious growth and land use policies throughout the County, in conjunction with previously established policies contained within the general plan, and should play a major role in determining future land use.

GEOLOGIC HAZARDS IN CALIFORNIA

TO THE YEAR 2000:

A $55 BILLION PROBLEM

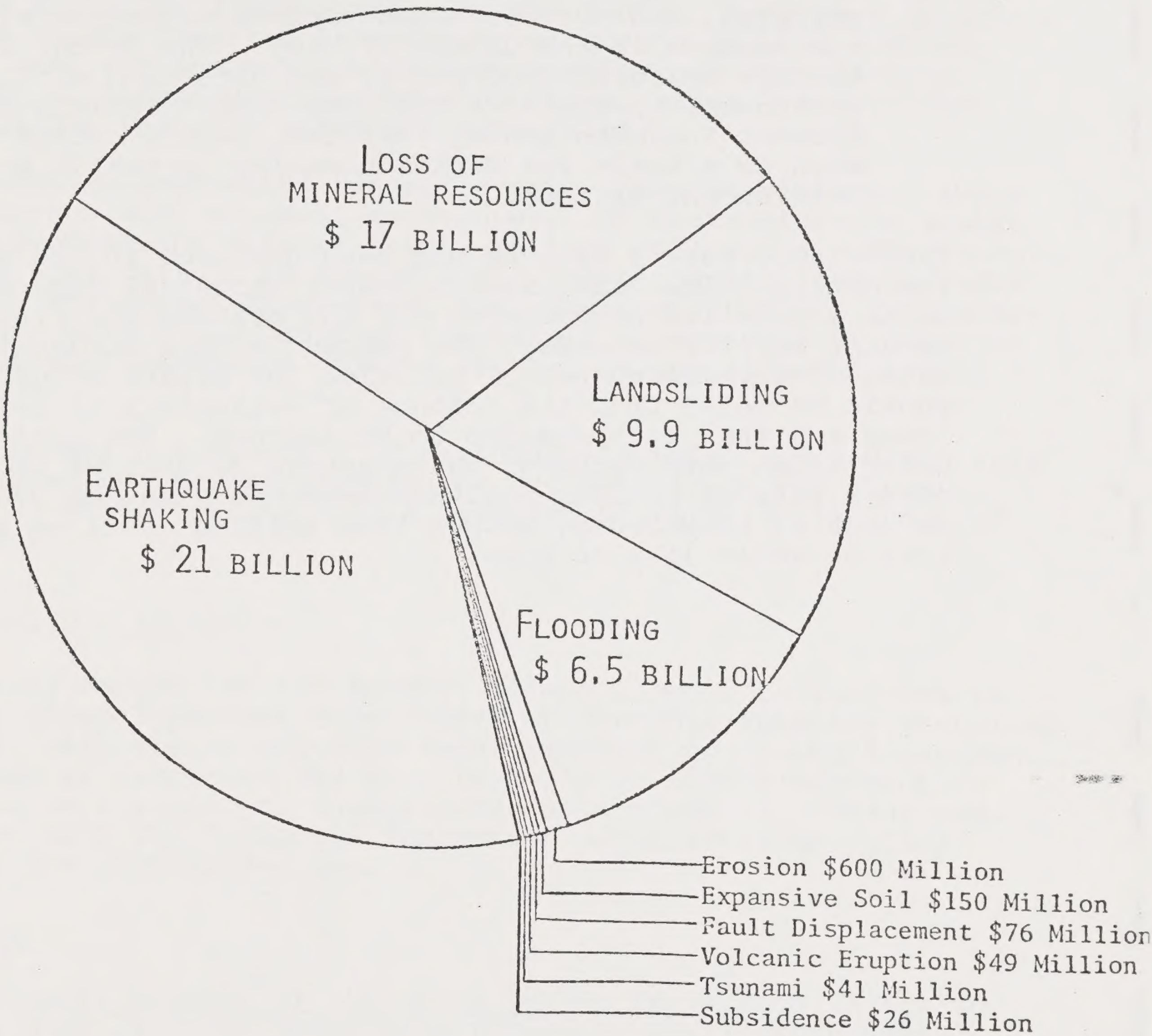

FIGURE 1.

Source: Urban Geology, Master Plan for California, Bulletin 198, 1973.

- To recommend policies that would reduce the adverse impact of those hazards if they are realized. Specifically, the Element evaluates both primary and secondary seismic hazards. The intent of the recommended policies is to provide an opportunity to reduce the loss of life, property damage, and social and economic dislocations in the event of a major earthquake.

- To serve as an official guide to the Board of Supervisors, the Planning Commission, and other governmental bodies, citizens, and private organizations concerned with seismic hazards in the County of Mono. The intent is to establish uniformity of policy and direction within county government to minimize the risk from seismic events. The Element includes goals; policies, safety criteria, and maps as a basis for decision-making in public and private development matters.

The Seismic Safety Element has been prepared in two volumes for the County. The first is the County Technical Report which contains a detailed presentation of the methods and findings regarding seismic hazards. The second is this document which contains a recommended set of policies for hazard reduction. It should be noted that the science of seismology is relatively young and that much remains to be learned. The basic philosophy under which this document was prepared is that we should incorporate natural hazards analysis into the planning process based on what we know today, rather than waiting until we know all that we would like to know.

II. EXISTING CONDITIONS

A. TYPES OF HAZARDS

There are several types of seismic hazards which can be grouped in a cause-and-effect classification that is the basis for the order of their consideration. Earthquakes originate as shock waves generated by movement along an active fault. The primary seismic hazards are ground shaking and the potential for ground rupture along the surface trace of the fault. Secondary seismic hazards result from the interaction of ground shaking with existing soil and bedrock conditions, and include liquefaction, settlement, landslides, tsunamis or "tidal waves," and seiches (oscillating waves in lakes and reservoirs).

The potentially-damaging natural events (hazards discussed above may interact with man-made structures. If a structure is unable to accommodate the natural event, failure will occur. The potential for such failure is termed a structural hazard, and includes not only structures themselves, but also the potential for damage or injury that could occur as the result of movement of loose or inadequately restrained objects within, on, or adjacent to a structure.

A more in-depth discussion of earthquake terminology and concepts is included in the Introduction of the Seismic Safety Element Technical Report, along with a Glossary of Terms in the back of the Report.

B. TECHNICAL ANALYSIS

The Policy Report for the Seismic Safety Element is intended to reflect those important conclusions or findings from the technical analysis that should require direct response by County Government. The range of responses may vary from simple acknowledgement to creation or revision of county codes or ordinances. Major conclusions from the Technical Report for which specific policy actions are recommended are:

Faulting

1. The north segment of the Owens Valley fault zone is active. Its high level of seismicity (frequent small earthquakes) suggests that the continuing strain accumulation will probably be released as moderate to possibly large earthquakes at more frequent intervals, rather than as one very large event.

2. The Round Valley-Hilton Creek fault zones, in the southwestern corner of the County, are active and have the highest levels of seismicity of any part of the study area.

3. The Inyo Craters fault zone, which extends from the June Lake Loop area south to near Mammoth Lakes, is considered active and the potential location of violent volcanic eruption and ground rupture, as well as strong ground shaking.

4. The Bridgeport Valley fault system is seismically active and is likely to be the source of small to moderate earthquakes in the future.

5. The Antelope Valley fault zone is also seismically active and apparently has the same risk level as the Bridgeport Valley fault system.

6. Detailed geological studies, including subsurface investigations, are recommended, as the need arises, within each of the fault zones discussed above. The purpose of the studies would be to determine recency of movement, define active traces, and to establish adequate building setbacks. The investigations can either be carried out on a county- or community-wide basis or on a project-by-project basis.

Ground Shaking

1. The primary seismic hazard in the County is strong to severe ground shaking generated by movement within the Owens Valley, Round Valley-Hilton Creek, Inyo Craters, Bridgeport Valley, and Antelope Valley fault zones.

2. The County is divided into seismic zones based on distance to the causitive fault and general geologic conditions. The zonation is presented on Plate I in the Technical Report.

3. The general characteristics of expected ground shaking for each seismic zone has been indicated by response spectra, which describe ground motion in terms of displacement, velocity, and acceleration.

4. Response spectra shown as Figures 23 through 30 in the Technical Report are intended for consideration by structural engineers in the design of new construction and the seismic evaluation of existing structures. The risk section of this report sets forth "acceptable risk" decisions for utilizing the response spectra.

Secondary Seismic Hazards

1. Liquefaction and settlement are potential hazards where areas of loose alluvium and shallow groundwater will be subjected to strong earthquake shaking. Specific areas identified as having a significant potential for liquefaction and/or settlement are areas underlain by cohesionless soils with groundwater less than 30 feet from the surface. The areas are delineated on Plates VII and VIII for the planning areas of Mammoth and June Lake, respectively.

2. Landsliding and slope instability are significant hazards generally confined to the hilly and mountainous terrain defined by the "B" zones on Plate I. Plates VII and VIII delineate the potential for landsliding in the Mammoth and June Lake areas in more detail.

Volcanic Hazards

1. A significant hazard from volcanic activity is present along the trend of the Inyo Craters fault zone between Mammoth and June Lake. While no precedent has been set regarding the delineation of Hazard Management Zones along an active zone of volcanism, we recommend that such a zone be established along the Inyo Craters fault zone. The Zone should be similar to the Special Studies Zones assigned to faults under the Alquist-Priolo legislation (SB 5). The actual width of the Hazard Management Zone is open for discussion, but we suggest that one-half mile on each side of the fault zone seems reasonable.

   It is important to note that some warning, in the form of a marked increase in local seismicity and changes in benchmark elevations, will likely take place prior to an eruption and that orderly evacuation of the area will probably be possible.

C. RISK

The Council on Intergovernmental Relations (CIR), the functions of which are presently being performed by the Office of Planning and Research, defines "Risk" from natural and man-made hazards in three categories:

1. Acceptable Risk: The level of risk below which no specific action by government is deemed to be necessary.

2. Unacceptable Risk: The level of risk above which specific action by government is deemed to be necessary to protect life and property.

3. Avoidable Risk: A risk which need not be taken because individual or public goals can be achieved at the same, or less, total "cost" by other means without taking the risk.

Determining levels of appropriate or acceptable risk is a multidisciplinary process which relies heavily on citizen input. There is no such thing as a perfectly hazard-free environment. Natural and man-made hazard of some kind are always present, especially in urban areas. However, effective loss-reduction measures can be used in mitigating the consequences of known hazards. The determination of acceptable risk involves making a

judgment about risk, either explicit or implicit, which is a necessary step in planning for loss-reduction from natural hazards.

The central concept used in determining acceptable risk is the definition of natural events in terms of magnitude and frequency. The magnitude of an event refers to its size. The frequency of an event refers to the number of times it occurs during a certain period of time. That is, the less often an event occurs, the greater is its size and potential impact. For example, rainstorms occur annually in the County, but most often they are of low magnitude. However, on relatively infrequent occasions, a storm of great magnitude will occur and result in destructive flooding. A way of summarizing this concept with respect to an earthquake is the longer it waits, the bigger it will be.

The magnitude-frequency concept is involved in the decisions regarding acceptable risk in that the community must judge what magnitude event should be planned for. That judgment is based on the frequency or recurrence interval of the hazardous event. A description of the magnitude and other characteristics of the event are then developed through a technical analysis. This information allows planners and engineers to develop loss-reduction measures and to design structures to provide protection up to the level of acceptable risk. In this sense, the magnitude earthquake used in defining acceptable risk may be thought of as a "design earthquake."

The determination of acceptable risk from hazardous events also involves differentiating among man-made structures according to their potential effect on the loss of life and their importance in terms of continued community functioning. In the hours immediately following the 1971 San Fernando earthquake in Southern California, emergency services were impaired by damage to police and fire stations, communication networks, and utility lines. Several hospitals were seriously damaged and unable to continue functioning. These facilities and others are vital to the community's ability to respond to a major disaster and to minimize loss of life and property. The experience in San Fernando emphasized the need to provide these "critical facilities" a higher level of protection from earthquakes than limited or normal occupancy structures or other non-critical structures. As a minimum, all structures which could have an effect on the loss of life should be designed to remain standing in the event of a major earthquake even if rendered useless. Critical facilities, on the other hand, should not only remain standing, but should be able to operate at peak efficiency in the event of a disaster. The taxonomy of Critical Facilities presented is intended for use as a guide in evaluating the importance of each facility relative to overall public safety in terms of seismic hazards.

The following seismic events are recommended as the basis for establishing earthquake design standards:

Facility Type	Recurrence Interval	"Design Earthquake" (Richter magnitude)	
Critical	500 Years	6 1/2	Owens Valley Fault
		7	Round Valley-Hilton Creek
		6	Inyo Craters
		6 1/4	Bridgeport Valley
		6	Antelope Valley
Non-Critical	100 Years	6	Round Valley-Hilton Creek

The risk from volcanic activity in the June Lake-Mammoth area is a special case. The recurrence interval for volcanic episodes along the Inyo Craters fault zone appears to be approximately 1,000 years. While this long recurrence interval is beyond that which is normally utilized for planning purposes, we feel the lack of data necessitates some conservatism. It is our opinion that land-use controls, particularly where critical facilities are concerned, should be implemented along the Inyo Craters trend, and that the establishment of a Volcanic Hazard Management Zone is appropriate.

TAXONOMY OF CRITICAL FACILITIES

Land Use/Facility	Safety Characteristic			Classification	
	Potential Effect on Loss of Life	Emergency Response	Vital Function	Critical	Normal
Developed Land					
RESIDENTIAL					
- Single Family					X
- Multi-family and Mobile homes					X
- Apartments					X
COMMERCIAL					
- Neighborhood Centers (e.g., grocery, barber, drug store)					X
- Community Centers (e.g., private offices, banks, restaurants, comparison shopping)					X
- Highway Centers (e.g., motels, fast food, restaurants)					X
- Heavy Commercial/ Light Industry (e.g., contractors yards, distribution warehouses, manufacturing and assembly plants)					X
- Heavy Industry					X
PUBLIC AND SEMI-PUBLIC USES					
- Hospitals		X	X	X	
- Schools/Colleges	X			X	
- Parks and Recreation Areas					X
- Government Facilities (e.g., civil defense quarters, fire and police stations, government offices)		X	X	X	
- Utilities (e.g., power plants (nuclear fossil fuel) gas and electric lines and stations, large dams, radio/TV/microwave centers and lines, aqueducts, pipelines, sewage treatment facilities, gas stations, waterworks)		X	X	X	
- Roads and Highways		X	X	X	
- Railroads			X	X	
- Airports			X	X	
- Assembly Halls (e.g., theaters, auditoriums)	X			X	
- Refuse Disposal Sites					X
- Cemeteries					X
Undeveloped Land					
- Agriculture					X

III. HAZARD REDUCTION

A. ORGANIZATION AND PURPOSE OF RECOMMENDATIONS

The previous section of this report represents a synthesis of the existing seismic hazards throughout the County, and supplements the criteria documented in the Technical Section of the report. The intent of that section is to summarize the general framework within which planning for seismic safety should take place. In this section, recommendations are presented which encompass the general planning goals and policies for hazard reduction in Mono County. This section also outlines specific recommended planning actions to implement the Element's goals and policies.

Allocation of resources toward achievement of these goals will be a continuing consideration of decision makers over a long period of time. The achievement of these goals can be met in numerous ways, such as provision of adequate medical facilities, proper disaster planning through the Office of Emergency Services; carrying out of programs that are suggested in this report, and informing the citizenry and government employees of their obligations in time of emergency -- of any kind. Should a severe disaster ever occur in the County, it will be up to the citizenry to make many of the decisions necessary for the saving of life and property. Government can help - but it cannot do so without the consent and assistance of its citizens, and it is unreasonable to expect that government can do the job alone.

B. GOAL RECOMMENDATIONS

To plan effectively for reducing hazards to acceptable levels of risk, it is necessary that goals be set and adhered to. Goals address general policy directions which form the basis for planning decisions and actions. The goals presented below are considered to be at least the minimum requirement for a safer environment for the citizens of Mono County.

- ° To minimize injury and the loss of life from hazardous natural events.
- ° To minimize damage to public and private property resulting from hazardous natural events.
- ° To insure the continuity of vital services and functions.
- ° To minimize social and economic dislocations resulting from injury, loss of life, and property damage caused by hazardous natural events.
- ° To provide for education of the public to the risks associated with hazardous natural events.

C. POLICY RECOMMENDATIONS

The following recommended policies complement the planning goals and define specific directions for the County to take in reducing natural hazards.

1.0 Adopt new ordinances and amend existing ordinances which require the incorporation of seismic safety considerations in developments under the County's jurisdiction.

2.0 Provide for the identification and evaluation of existing structural hazards.

3.0 Risks associated with hazardous structures should be reduced to acceptable levels through orderly hazard reduction programs.

4.0 Provide for more detailed scientific analyses of seismic hazards in the County.

5.0 Regulate land use in areas of significant seismic hazard.

6.0 Provide for the education of the public regarding the nature and extent of natural hazards in the study area.

7.0 Provide for the maintenance and upgrading of disaster response plans.

8.0 Provide for review and upgrading of the Seismic Safety Element.

D. IMPLEMENTATION RECOMMENDATIONS

The implementation recommendations in this section are intended to provide the County with a series of specific planning actions to achieve the goals of this Element and carry out the policies recommended above. While it would be advisable to fully implement each of the recommended actions, it is recognized that unlimited resources to that end are not available. Those recommended actions should be thought of, then, as options to be implemented as resources provide. To aid in determining priorities for the allocation of resources in the County, the recommended policies and actions are listed below in their general order of importance to achieving the goals of the Element.

1.0 Adopt new ordinances and amend existing ordinances which require the incorporation of seismic safety consideration in developments under the County's jurisdiction.

1.1 Adopt and apply the Uniform Building Code.

1.2 Using the geological data provided in the Seismic Safety Element, apply Chapter 23, Section 2312, (Earthquake Regulations) of the Uniform Building Code to account for the expected maximum ground accelerations of the recommended design earthquakes. Amending Section 2312 involves revising the basic lateral force equation in the section, and requires analysis by a qualified structural engineer. The intent of the revisions is to reflect the levels of acceptable risk adopted in this Element.

1.3 Enforce the County Grading Ordinance (Chap. 13.08), which requires soils engineering and geological engineering investigations in areas of significant landslide risk and in potential liquefaction and subsidence areas. To insure adequate review and use of the investigation reports, the County should maintain a full-time qualified engineering geologist to review reports and assist the Building and Safety Department in designing public projects.

2.0 Provide for the identification and evaluation of existing structural hazards.

2.1 It is recommended that structures within County Lands be inspected for conformance with the amended Uniform Building Code earthquake regulations. Inspections should be conducted according to the following priorities:

(a) emergency service facilities (e.g., fire and police stations, hospitals);

(b) other critical facilities (e.g., schools, utility lines, government buildings);

(c) high occupancy non-critical facilities (e.g., dormitories, apartments);

(d) normal or limited occupancy non-critical facilities (e.g., offices, low density residential buildings).

Within each priority group, it is recommended that facilities built before 1933 be inspected first, then those built between 1933 and 1948, and, lastly, those constructed after 1948. The significance of the year 1933 is that the Field and Riley Acts became law in California that year and required reinforcement in schools and certain other structures (Appendix B). Structures built before 1933, especially larger commercial structures, are more likely to be unreinforced masonry block buildings which are most susceptible to

collapse in earthquakes. In 1948, earthquake regulations were adopted as a legally binding section of the UBC for the first time. Previously, earthquake standards were set forth in the Appendix of the UBC and were not a mandated part of the Code. It is more likely, then, that a building constructed before 1948 would be less able to withstand the shock of an earthquake than one built after 1948. It is also recommended that public structures be inspected before private structures.

Table 1 (abridged from Pacific Fire Rating Bureau) may also be used as a general indicator in older construction for use in establishing a priority ranking system for evaluating structures. Buildings with a high susceptibility to damage rating (five or over) should be selected for structural inspection before those with low ratings. A high priority should be placed on establishing a definition of facilities that handle explosive, flammable, or toxic materials and on an evaluation of their seismic vulnerability.

2.2 Caltrans and the County Road Department should review their facilities and roadways within the County to determine the potential impact of expected earthquakes, and should forward comments to the County. The Circulation Element of the General Plan and potential evacuation routes should be revised, if necessary.

2.3 The Los Angeles Department of Water and Power and the Southern California Edison Company should review their facilities and distribution/transformation networks and centers to determine the potential impact of expected earthquakes, and should forward comments to the County.

3.0 Risks associated with hazardous structures should be reduced to acceptable levels through orderly hazard reduction programs.

3.1 Structures identified as not conforming to amended earthquake standards should be brought into conformance with acceptable levels of risk by programs including, but not limited to, structural rehabilitation, occupancy reduction, and demolition and reconstruction.

TABLE 1
HAZARD COMPARISON OF NON-EARTHQUAKE-RESISTIVE BUILDINGS

Simplified Description of Structural Type	Relative Damagability (in order of increasing susceptibility to damage)
Small wood-frame structures, i.e. dwellings not over 3,000 sq. ft. and not over 3 stories	1
Single or multistory steel-frame buildings with concrete exterior walls, concrete floors, and concrete roof. Moderate wall openings	1.5
Single or multistory reinforced-concrete buildings with concrete exterior walls, concrete walls, and concrete roof. Moderate wall openings	2
Large area wood-frame buildings and other wood frame buildings	3 to 4
Single or multistory steel-frame buildings with unreinforced masonry exterior wall panels; concrete floors and concrete roof	4
Single or multistory reinforced-concrete frame buildings with unreinforced masonry exterior wall panels, concrete floors and concrete roof	5
Reinforced concrete bearing walls with supported floors and roof of any material (usually wood)	5
Buildings with unreinforced brick masonry having sand-line mortar; and with supported floors and roof of any material (usually wood)	7 up
Bearing walls of unreinforced adobe, unreinforced hollow concrete block, or unreinforced hollow clay tile	Collapse hazard in moderate shocks

This table is intended for buildings not containing earthquake bracing, and in general, is applicable to most older construction. Unfavorable foundation conditions and/or dangerous roof tanks can increase the earthquake hazard greatly.

3.2 A review committee should be established by the Board of Supervisors to consider the desirability of initiating condemnation proceedings against structures found to be unsafe.

3.3 The County should advocate the expansion of State and Federal relocation assistance funds and programs to aid persons and businesses displaced from hazardous buildings.

4.0 <u>Provide for more detailed scientific analyses of seismic hazards in the study area</u>.

4.1 Provide for a detailed field study of all active faults in the County including the Owens Valley, Hilton Creek-Round Valley, Inyo Craters, Bridgeport Valley, and Antelope Valley fault zones, to provide a more refined evaluation of the locations and surface rupture potential of the fault traces.

4.2 Establish a monitoring system which may include an accelerograph array and/or a survey net, in the Inyo Craters fault zone area to serve as an early warning measure in the event of renewed volcanic activity.

4.3 Such studies as called for in 4.1 and 4.2 above, may be undertaken by County or local government or by private enterprise. In any case, the County geologist should be notified in advance of subsurface work to secure his evaluation of fault activity and location during the trenching phase of 4.1, and he should be apprised of the results of the monitoring program in 4.2.

4.4 Require site-by-site ~~soils and geologic~~ engineering studies for proposed development projects in areas of significant landslide risk to assess natural and graded slope stability. Slope stability calculations should incorporate the ground shaking parameters presented in the Technical Report.

4.5 Require site-by-site soils and geologic engineering studies in areas of potential liquefaction and settlement and evaluate these potential hazards using the ground shaking parameters presented in the Technical Report.

4.6 Institute a building strong-motion instrumentation program for buildings over four (4) stories in height, if such buildings are anticipated.

5.0 Regulate land use in areas of significant natural hazard.

5.1 No development should be permitted in any Alquist-Priolo Special Study Zone until detailed geological evaluations of the surface rupture potential of the faults in question are completed and adequate building set-backs from these faults are established.

5.2 No development of critical facilities should be permitted within the Volcanic Hazard Management Zone extending for 1/2 mile on either side of the Inyo Craters fault zone.

5.3 No development should be permitted in areas of significant landslide risk without a required slope stability investigation at the site level.

5.4 No critical facilities should be permitted in areas of potential liquefaction without requiring a detailed site investigation which addresses the potentials for liquefaction and settlement.

6.0 Provide for the education of the public regarding the nature and extent of seismic hazards in Mono County.

6.1 Develop an information release program to familiarize citizens with the Seismic Safety Element. Special attention should be afforded to those groups particularly susceptible to seismic hazards including, but not limited to, school districts, agencies involved with the aged, and agencies involved with handicapped persons. These agencies should be encouraged to develop educational programs of their own relative to hazard awareness. The conclusions and recommendations of these elements should also be provided to land developers and those in the real estate profession. Appendix A provides a list of earthquake safety procedures.

6.2 Establish community programs that train volunteers to assist police, fire, and civil defense personnel during and after a major earthquake.

7.0 Provide for the maintenance and upgrading of disaster response plans.

7.1 Maintain a disaster response program for the County. Objectives of the program should be:

(a) To save lives and protect property;

(b) To provide a basis for direction and control of emergency operations;

(c) To provide for the continuity of government;

(d) To repair and restore essential systems and services (e.g., emergency water supplies);

(e) To provide for the protection, use and distribution of remaining resources;

(f) To coordinate operations with the civil defense emergency operations or other jurisdictions;

(g) To provide for a maximum degree of self-sufficiency by the City in the event of a major disaster.

Since a large earthquake will severely affect many cities and counties and hundreds of thousands of people, the efforts of the Federal and State emergency services will be severely over-extended. It is advisable that the County be prepared to serve itself and maintain continued functioning of necessary services rather than expect adequate aid from outside organizations.

7.2 Conduct periodic earthquake and volcanic emergency drills. These drills should be coordinated on a regional basis in cooperation with all involved jurisdictions.

8.0 <u>Provide for review and upgrading of the Seismic Safety Element</u>.

8.1 Upon adoption of the Seismic Safety Element, a review committee should be established to oversee the implementation of the Element and to advise the board of implementation progress. This committee should be composed of the Planning Director, the Director of Building and Safety, the County Geologist, and at least one representative from each of the police and fire protection service agencies.

8.2 The Seismic Safety Element should be reviewed by the County Planning Department annually and should be comprehensively revised every five years of whenever substantially new scientific evidence becomes available.

IV. RELATIONSHIPS TO OTHER GENERAL PLAN ELEMENTS

The Seismic Safety Element is the major natural hazards analysis in the General Plan and, as such, has important policy implications for other elements in the Plan. In particular, the Seismic Safety Element provides significant information for the Land Use, Housing, Open Space, Public Safety, and Circulation Elements. It is recommended that these Elements be prepared or revised to give specific recognition to the policies adopted in the Seismic Safety Element.

The Land Use Element will be influenced most directly by the recommendations of Policy 5.0 to regulate land use in areas of significant seismic hazards. The Land Use Element may also recommend land use controls for those areas in which "stacking" or combinations of individual hazard zones result in a high level of overall hazard. Figure 1 shows the effects of "stacking" on various land uses.

The policies of the Element provide input to the Housing Element primarily by recommending design and construction modifications. The following recommendations pertain directly to the Housing Element:

1. All new construction should conform to the revised Uniform Building Code Earthquake Regulations.

2. Existing high occupancy residential structures found to be seismically vulnerable should be strengthened or replaced or their occupancy level should be reduced.

The Seismic Safety Element identifies certain areas which should be considered for open space designation a part of the Open Space Element. These areas include lands designated as Hazard Management Zones and those with significant landslide potential.

The Circulation Element should recognize that the transportation network in the County will be hard hit in the event of a major earthquake. An earthquake will affect primarily freeway overpasses, road bridges, and railroad grade crossings. The effects expected will be similar to what occurred in the Sylmar-San Fernando Valley area of Southern California in the 1971 earthquake. The response spectra presented in the Technical Section of the Seismic Safety Element should be used by structural engineers in the evaluation of existing freeway overpasses and other important grade separations. New construction of bridges, overpasses, and other grade crossings should also utilize seismic response design criteria.

		BUILDING TYPE/LAND USE	SEISMIC HAZARDS ZONES (SHOWN ON PLATES I THROUGH V)										
			1/HMZ	2/IA	IB	IIA	IIB	IIIA	IIIB	IVA	IVB	3/L	4/Liq
CRITICAL FACILITIES	EMERGENCY RESPONSE	Hospitals, Fire Stations, Police Stations, Civil Defense Headquarters, Lifeline Systems for Gas, Electric, Water, Telephone, Emergency Broadcast Systems, Ambulance Services, Power Plants (Nuclear, Fossil Fuel), Dams, Reservoirs.	⊕	●	●	⊘	○	⊘	●	⊕	⊕	⊘	⊘
	NON-EMERGENCY RESPONSE	Schools, Theaters, Auditoriums, Utility Substations, Sewage Treatment Plants, Waterworks, Local Gas and Electric Lines, Major Highways, Bridges, Tunnels, Aqueducts, Pipe Lines, Public Service Facilities, Public Assemply Capacity of 100 or more.	⊕	●	●	○	○	⊘	⊘	⊘	⊘	⊘	⊘
NON-CRITICAL FACILITIES	CATEGORY I	Heavy Industrial, Office Buildings, Commercial Centers, Hotels and Motels, Banks and Financial Establishments, High Density Residential, Service Stations, Healthcare Clinics.	⊘	●	●	○	●	○	○	⊘	⊘	○	○
	CATEGORY II	Light Industrial, Low Density Residential, Warehousing and Storage, Agriculture, Parks.	○	●	●	●	●	○	○	⊘	○	○	○

Explanation

● Generally Suitable ○ Provisionally Suitable ⊘ Generally Unsuitable ⊕ Restricted

Notes: This Chart is for General Land Use Planning only. Suitability for specific uses on a particular site must be confirmed by further investigation. An area evaluated as generally unsuitable for a particular use does not necessarily preclude the use if no other suitable alternative sites are available, provided that all potential hazards can be mitigated. In the case of restricted areas, mitigation is extremely difficult and in some instances, impossible.

1/ Hazard Management Zone 2/ Ground shaking zones 3/ Landslide risk zones 4/ Liquefaction potential zones

FIGURE 1. Land Use Matrix.

The Seismic Safety Element provides the major input to the Public Safety Element. Clearly, many of the policy objectives of the Public Safety Element should address seismic hazards. Thus, in the event of a seismic emergency, the County's ability to continue functioning will depend to a large extent on the effectiveness of the Public Safety Element. Fire safety, structural inspection, water supply, and evacuation routes are additional factors to be considered in the Public Safety Element.

APPENDIX A

GLOSSARY OF TERMS

Active Fault - One that has moved in recent geologic time and which is likely to move again in the relatively near future. Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward.

Alluvial - Pertaining to or composed of alluvium, or deposited by a stream or running water. (AGI, 1972)

Alluvium - A general term for clay, silt, sand, gravel or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of a mountain slope. (AGI, 1972)

Amplification - Elaboration; augmentation; addition (Webster). As used herein, near-surface amplification is the augmentation of wave amplitude resulting from the change in physical properties in near-surface layers (see Introduction).

Amplitude - The extent of the swing of a vibrating body on each side of the mean position. (Webster)

Block Glide - A translational landslide in which the slide mass remains essentially intact, moving outward and downward as a unit, most often along a pre-existing plane of weakness such as bedding, foliation, joints, faults, etc. (AGI, 1972)

Cohesion - Shear strength in a sediment not related to interparticle friction. (AGI, 1972)

Colluvium - (a) A general term applied to any loose, heterogenous, and incoherent mass of soil, material or rock fragments deposited chiefly by mass-wasting, usually at the base of a steep slope or cliff. (b) Alluvium deposited by unconcentrated surface runoff or sheet erosion, usually at the base of a slope. (AGI, 1972)

Compaction - Reduction in bulk volume or thickness of, or the pore space within, a body of fine-grained sediments in response to the increasing weight of overlying material that is continually being deposited, or to the pressure resulting from earth movements within the crust. It is expressed as a decrease in porosity brought about by a tighter packing of the sediment particles. (AGI, 1972)

Consolidated Material - Soil or rocks that have become firm as a result of compaction.

Critical Damping - Damping to the point at which the displaced mass just returns to its original position without oscillation. (AGI, 1972).

Damping - The resistance to vibration that causes a decay of motion with time or distance, e.g. the diminishing amplitude of an oscillation. (AGI, 1972)

Differential Settlement - Nonuniform settlement; the uneven lowering of different parts of an engineering structure, often resulting in damage to the structure. (AGI, 1972)

Displacement (Geological) - The relative movement of the two sides of a fault, measured in any chosen direction; also, the specific amount of such movement. Displacement in an apparently lateral direction includes strike-slip and strike separation; displacement in an apparently vertical direction includes dip-slip and dip separation. (AGI, 1972)

Displacement (Engineering) - The geometrical relation between the position of a moving object at any time and its original position. (Webster)

Epicenter - That point on the Earth's surface which is directly above the focus of an earthquake. (AGI, 1972)

Fault - A surface or zone of rock fracture along which there has been displacement, from a few centimeters to a few kilometers in scale. (AGI, 1972)

Fault Surface - In a fault, the surface along which displacement has occurred. (AGI, 1972)

Fault System - Two or more interconnecting fault sets. (AGI, 1972)

Fault Zone - A fault zone is expressed as a zone of numerous small fractures or by breccia or fault gouge. A fault zone may be as wide as hundreds of meters. (AGI, 1972)

Focus (Seism) - That point within the Earth which is the center of an earthquake and the origin of its elastic waves. Syn: hypocenter; seismic focus; centrum (see Introduction). (AGI, 1972)

Ground Response - A general term referring to the response of earth materials to the passage of earthquake vibration. It may be expressed in general terms (maximum acceleration, dominant period, etc.), or as a ground-motion spectrum.

Hypocenter - See focus.

Intensity (earthquake) - A measure of the effects of an earthquake at a particular place on human and/or structures. The intensity at a point depends not only upon the strength of the earthquake, or the earthquake magnitude, but also upon the distance from the point to the epicenter and the local geology at the point. (AGI, 1972)

Isoseismal line - A line connecting points on the Earth's surface at which earthquake intensity is the same. It is usually a closed curve around the epicenter. Syn: isoseism; isoseismic line; isoseismal. (AGI, 1972)

Liquefaction - A sudden large decrease in the shearing resistance of a cohesionless soil, caused by a collapse of the structure by shock or strain, and associated with a sudden but temporary increase of the pore fluid pressure. (AGI, 1972)

Macroseismic data - Used herein to describe instrumentally recorded earthquakes generally in the range of Richter magnitude 3.0 or more. (This use differs from the AGI definition of "macroseismic observations").

Magnitude (earthquake) - A measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic observations. As defined by Richter, it is the logarithm, to the base 10, of the amplitude in microns of the largest trade deflection that would be observed on a standard torsion seismograph (static magnification = 2800; period = 0.8 sec; damping constant = 0.8) at a distance of 100 kilometers from the epicenter. (AGI, 1972)

Microseismic data - Used herein to describe instrumentally recorded earthquakes generally in the range of Richter magnitude 3.0 or less. (This use is consistent with the AGI definition of microseism and microseismometer, but is more restricted than their definition of microseismic data).

Natural period - The period at which maximum response of a system occurs. The inverse of resonant frequency.

Normal fault - A fault in which the hanging wall appears to have moved downward relative to the footwall. The angle of the fault is usually 45-90 degrees. This is dip-separation, but there may or may not be dip-slip. (AGI, 1972)

Predominant period - The period of the acceleration, velocity or displacement which predominates in a complex vibratory motion. In the analysis of earthquake vibrations, predominant period is normally the period of the maximum amplitude of the acceleration spectrum.

Response spectrum - An array of the response characteristics of a structure or structures ordered according to period or frequency. The structures are normally single-degree-of-freedom oscillators, and the characteristics may be displacement, velocity or acceleration (see Introduction).

Seiche - All standing waves on any body of water whose period is determined by resonant characteristics of the containing basin as controlled by its physical dimensions. (U.S. Geol. Survey Prof. Paper 544-E)

Seismic seiche - Standing waves set up on rivers, reservoirs, ponds and lakes at the time of passage of seismic waves from an earthquake. (U.S. Geol. Survey Prof. Paper 544-E)

Shear - A strain resulting from stresses that cause or tend to cause contiguous parts of a body to slide relatively to each other in a direction parallel to their plane of contact; specifically, the ratio of the relative displacement of these parts to the distance between them. (AGI, 1972)

Shear wave or S-wave - That type of seismic body wave which is propagated by a shearing motion of material so that there is oscillation perpendicular to the direction of propagation. It does not travel through liquids. (AGI, 1972)

Slip - On a fault, the actual relative displacement along the fault plane of two formerly adjacent points on either side of the fault. Slip is three dimensional, whereas separation is two dimensional. (AGI, 1972)

Strike-slip fault - A fault, the actual movement of which is parallel to the strike (trend) of the fault. (AGI, 1972)

Subsidence - A local mass movement that involves principally the gradual downward settling or sinking of the solid Earth's surface with little or no horizontal motion and that does not occur along a free surface (not the result of a landslide or failure of a slope. (AGI, 1972)

Tectonic - Of or pertaining to the forces involved in, or the resulting structures or features of the upper part of the Earth's crust. (mod. from AGI, 1972)

Tsunami - A gravitational sea wave produced by any large-scale, short-duration disturbance of the ocean floor, principally by a shallow submarine earthquake, but also by submarine earth movement, subsidence, or volcanic eruption, characterized by great speed of propagation (up to 950 km/hr.), long wavelength (up to 200 dm.), long period (5 min. to a few hours, generally 10 - 60 min.), and low observable amplitude on the open sea, although it may pile up to great heights (30 m. or more) and cause considerable damage on entering shallow water along an exposed coast, often thousands of kilometers from the source. (AGI, 1972)

Unconsolidated material - A sediment that is loosely arranged or unstratified or whose particles are not cemented together, occurring either at the surface or at depth. (AGI, 1972)

Water table - The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere. (AGI, 1972)

APPENDIX B

EARTHQUAKE SAFETY PROCEDURES

EARTHQUAKE SAFETY PROCEDURES

Before an Earthquake

1. Potential earthquake hazards in the home should be removed or corrected. Top-heavy objects and furniture, such as bookcases and storage cabinets, should be fastened to the wall and the largest and heaviest objects placed on lower shelves. Water heaters and other appliances should be firmly bolted down, and flexible connections should be used whenever possible.

2. Supplies of food and water, flashlight, a first-aid kit, and a battery-powered radio should be set aside for use in emergencies. Of course, this is advisable for other types of emergencies, as well as for earthquakes.

3. One or more members of the family should have a knowledge of first aid procedures because medical facilities nearly always are overloaded during an emergency or disaster, or may themselves be damaged beyond use.

4. All responsible family members should know what to do to avoid injury and panic. They should know how to turn off the elctricity, water, and gas; they should know the locations of the main switch and valves. This is particularly important for teenagers who are likely to be alone with smaller children.

5. It is most important for a resident of California to be aware that this is "earthquake country" and that earthquakes are most likely to occur again where they have occurred before. Building codes that require earthquake-resistant construction should be vigorously supported and, when enacted into law, should be rigorously enforced. If effective building codes and grading ordinances do not exist in your community, support their enactment.

During An Earthquake

1. The most important thing to do during an earthquake is to remain calm. If you can do so, you are less likely to be injured. If you are calm, those around you will have a greater tendency to stay calm, too. Make no moves or take no action without thinking about the possible consequences. Motion during an earthquake is not constant; commonly, there are a few seconds between tremors.

2. If you are inside a building, stand in a strong doorway or get under a desk, table, or bed. Watch for falling plaster, bricks, light fixtures, and other objects. Stay away from tall furniture, such as china cabinets, bookcases, and shelves. Stay away from windows, mirrors, and chimneys. In tall buildings, it is best to get under a desk if it is securely fastened to the floor, and to stay away from windows or glass partitions.

3. Do not rush outside. Stairways and exits may be broken or may become jammed with people. Power for elevators and escalators may have failed. Many of the 115 persons who perished in Long Beach and Compton in 1933 ran outside only to be killed by falling debris and collapsing chimneys. If you are in a crowded place such as a theater, athletic stadium, or store, do not rush for an exit because many others will do the same thing. If you must leave a building, choose your exit with care and, when going out, take care to avoid falling debris and collapsing walls or chimneys.

4. If you are outside when an earthquake strikes, try to stay away from high buildings, walls, power poles, lamp posts, or other structures that may fall. Falling or fallen electrical power lines must be avoided. If possible, go to an open area away from all hazards but do not run through the streets. If you are in an automobile, stop in the safest possible place, which, of course, would be an open area, and remain in the car.

After An Earthquake

1. After an earthquake, the most important thing to do is to check for injuries in your family and in the neighborhood. Seriously injured persons should not be moved unless they are in immediate danger of further injury. First aid should be administered, but only by someone who is qualified.

2. Check for fires and fire hazards. If damage has been severe, water lines to hydrants, telephone lines, and fire alarm systems may have been broken; contacting the fire department may be difficult. Some cities, such as San Francisco, have auxiliary water systems and large cisterns in addition to the regular system that supplies water to fire hydrants. Swimming pools, creeks, lakes, and fish ponds are possible emergency sources of water for fire fighting.

3. Utility lines to your house - gas, water, and electricity - and appliances should be checked for damage. If there are gas leaks, shut off the main valve which is usually at the gas meter. Do not use matches, lighters, or open-flame appliances until you are sure there are no gas leaks. Do not use electrical switches or appliances if there are gas leaks, because they give off sparks which could ignite the gas. Shut off the electrical power if there is damage to the wiring; the main switch usually is in or next to the main fuse or circuit breaker box. Spilled flammable fluids, medicines, drugs, and other harmful substances should be cleaned up as soon as possible.

4. Water lines may be damaged to such an extent that the water may be off. Emergency drinking water can be obtained from water heaters, toilet tanks, canned fruits and vegetables, and melted ice cubes. Toilets should not be flushed until both the incoming water lines and outgoing sewerlines have been

checked to see if they are open. If electrical power is off for any length of time, plan to use the foods in your refrigerator and freezer first before they are spoiled. Canned and dried foods should be saved until last.

5. There may be much shattered glass and other debris in the area, so it is advisable to wear shoes or boots and a hard hat if you own one. Broken glass may get into foods and drinks. Liquids can be either strained through a clean cloth such as a handkerchief or decanter. Fireplaces, portable stoves, or barbecues can be used for emergency cooking but the fireplace chimney should be carefully checked for cracks and other damages before being used. In checking the chimney for damage, it should be approached cautiously, because weakened chimneys may collapse with the slightest of aftershocks. Particular checks should be made of the roof line and in the attic because unnoticed damage can lead to a fire. Closets and other storage areas should be checked for objects that have been dislodged or have fallen, but the doors should be opened carefully because of objects that may have fallen against them.

6. Do not use the telephone unless there is a genuine emergency. Emergencies, and damage reports, alerts, and other information can be obtained by turning on your radio. Do not go sightseeing; keep the streets open for the passage of emergency vehicles and equipment. Do not speculate or repeat the speculations of other - this is how rumors start.

7. Stay away from beaches and other waterfront areas where seismic sea waves (tsunamis), sometimes called "tidal waves", could strike. Again, your radio is the best source of information concerning the likelihood that a seismic sea wave will occur. Also stay away from steep landslide-prone areas if possible, becuase aftershocks may trigger a landslide or avalnche, especially if there has been a lot of rain and the ground is nearly saturated. Also stay away from earthquake-damaged structures. Additional earthquake shocks known as "aftershocks" normally occur after the main shock, sometimes over a period of several months. These are usually smaller than the main shock but they can cause damage, too, particularly to damaged and already weakened structures.

8. Parents should stay with young children who may suffer psychological trauma if parents are absent during the occurrence of aftershocks.

9. Cooperate with all public safety and relief organizations. Do not go into damaged areas unless authorized; you are subject to arrest if you get in the way of, or otherwise hinder, rescue operations. Martial law has been declared in a number of earthquake disasters. In the 1906 disaster in San Francisco, several looters were shot.

10. Send information about the earthquake to the Seismological Field Survey to help earth scientists understand earthquakes better.

APPENDIX C

SUMMARY OF SIGNIFICANT COURT DECISIONS AND LEGISLATION

Summary of Significant Court Decisions and Legislation

(Source: Urban Geology Master Plan for California, 1973)

In recent years there have been many attempts by government to reduce losses from geologic hazards. The following summaries are some of the more important ones.

COURT DECISIONS

1. Sheffet decision (Los Angeles Superior Court Case No. 32487): Declared that a public entity is liable for damages to adjacent property resulting from improvements planned, specified or authorized by the public entity in the exercise of its governmental power. (The State Supreme Court refused to rehear this decision, which establishes a judicial precedent.)

2. L.A. County Superior Court (Case No. 684595 and consolidated cases): This decision found the County liable for damages which may have resulted from roadwork and the placement of fill by the County. This case was in regard to the Portuguese Bend landslide, Palos Verdes Hills, Los Angeles County, California.

3. City of Bakersfield vs Miller (48 Cal. Rptr. 889), heard in the State Supreme Court 1966: This decision affirms that the city may declare an older structure not in compliance with the newly adopted Uniform Building Code to be a public nuisance. Further, the city may enforce abatement of the non-conforming condition even though to do so may require the building to be demolished.

4. Burgess vs. Conejo Valley Development Co. (Connor vs. Great Western Savings and Loan Association) (73 Cal. Rptr. 369) heard in the State Supreme Court in 1968, concerning damage to tract homes from expansive soil in Thousand Oaks, Ventura County: This decision affirmed that the home buyer, both first buyer and all subsequent ones, has the right to protection from negligent construction practice leading to damage. In this case, neither contractor, county inspectors, nor representatives of the major lending institution acted to ascertain expansive soil conditions, or to prevent damage from them.

5. Oakes vs. The McCarthy Co. (California Appellate Reports, 2d Series, 267, 1968) the court held that in the Palos Verdes area, Los Angeles County, a developer and soils engineering company could be liable in negligence for damages to a home resulting from using improper (clay) fill material and improperly compacting that fill so that earth movement resulted. Also, the court awarded punitive damages against the developer for fraudulent conceal-

ment of material facts concerning the property, i.e., failure to volunteer to the prospective buyer that the house was built upon fill.

LEGISLATION

PUBLIC RESOURCES CODE

Section 660-662 and 2621-2625: These sections require the State Geologyst to delienate special studies zones encompassing potentially and recently active fault traces. It requires cities and counties to exercise specified approval authority with respect to real estate developments or structures for human occupancy within such delineated zones.

Section 2700-2708: These sections require the Division of Mines and Geology to purchase and install strong-motion instruments (to measure the effects of future earthquakes) in representative structure and geologic environments throughout the state.

Section 2750: Establishes a state mining and minerals policy which, among other things, encourages wise use of mineral resources.

EDUCATION CODE

Section 15002.1: This section requires that geological and soils engineering studies by conducted on all new school sites and on existing sites where deemed necessary by the Department of General Services.

Section 15451-15466: These sections constitute the Field Act and require that public schools be designed for the protection of life and property. These sections, enacted in 1933 after the Long Beach earthquake, are enforced by the State Office of Architecture and Construction in accordance with regulations contained in Title 21 of the California Administrative Code.

HEALTH AND SAFETY CODE

Sections 15000 et seq.: These sections require that geological and engineering studies by conducted on each new hospital or additions affecting the structure on an existing hospital, excepting therefrom one story Type V buildings 4000 sq. ft. or less in area.

Sections 19100-19150: These sections constitute the Riley Act and require certain buildings to be constructed to resist lateral forces, specified in Title 24 California Administrative Code.

Section 17922, 17951-17958.7: These sections require cities and counties to adopt and enforce the Uniform Building Code, including a grading section (chap. 70), a minimum protection against some geologic hazards.

BUSINESS AND PROFESSIONAL CODE

Section 7800-7887: These sections provide for the registration of geologists and geophysicists, and the certification of certain geologists in the specialty of engineering geology.

Section 11010: This section requires that a statement of the soil conditions be prepared and needed modifications be carried out in accordance with the recommendations of a registered civil engineer.

Section 11100-11629: These sections require studies in subdivisions to evaluate the possibilities of flooding and unfavorable soils.

GOVERNMENT CODE

Section 8589.5: This section requires that inundation maps and emergency evacuation plans be completed for areas subject to inundation by dam failure.

Section 65300-65302.1: These sections require that each city and county shall adopt the following elements:

Seismic Safety Element consisting of the identification and appraisal of seismic hazards including an appraisal of landsliding due to seismic events.

Conservation element including the conservation, development and utilization of minerals.

Safety element including protection of the community from geologic hazards including mapping of know geologic hazards.